TUTORIAL-6

Question 1.

What do you mean by Minimum Spanning tree?

What is the application of MST.

Soln A minimum spanning tree or minimum weight spanning or minimum weight spanning tree is a subset of the edges of a connected, edge-weighted undirected graph that connects all the vertices together, without any cycle and with minimum possible total edge weight.

Applications:

- Designing local ~~g~~ area network.
- Laying pipelines connecting offshore drilling sites, refineries and customer markets.
- Suppose you want to construct highways or railroads spanning ~~the~~ several cities then we use the concept of MST.
- To reduce cost, you use the concept of MST to connect the houses.

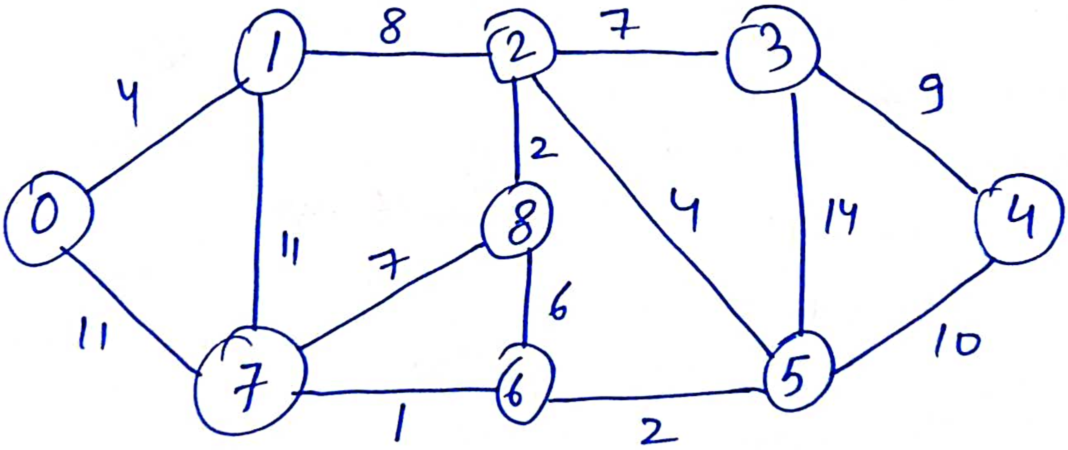
Question 2

Please analyse the time and space complexity of Prism's kruskal, dijkstra and Bellman ford algorithms.

Solⁿ

Algorithms	Time complenity	Space lomplenity
Prisms	$O(V^2)$	$O(V+E)$
kruskal	$O(E\log V)$	$O(\log E)$
Dijkstra	$O(V+E)$	$O(V+E)$
Bellemanford	$O(VE)$	$O(V)$

Ques 3 Apply Prims and kruskal algorithm on the graph to compute MST and its weight



Solⁿ kruskals.

Path	Weight
7 → 6	1
6 → 5	2
2 → 8	2
0 → 1	4
2 → 5	4
8 → 6	6
2 → 3	7
7 → 8	7
1 → 2	8
3 → 4	9
5 → 4	10
1 → 7	11
	14

…uskal's.

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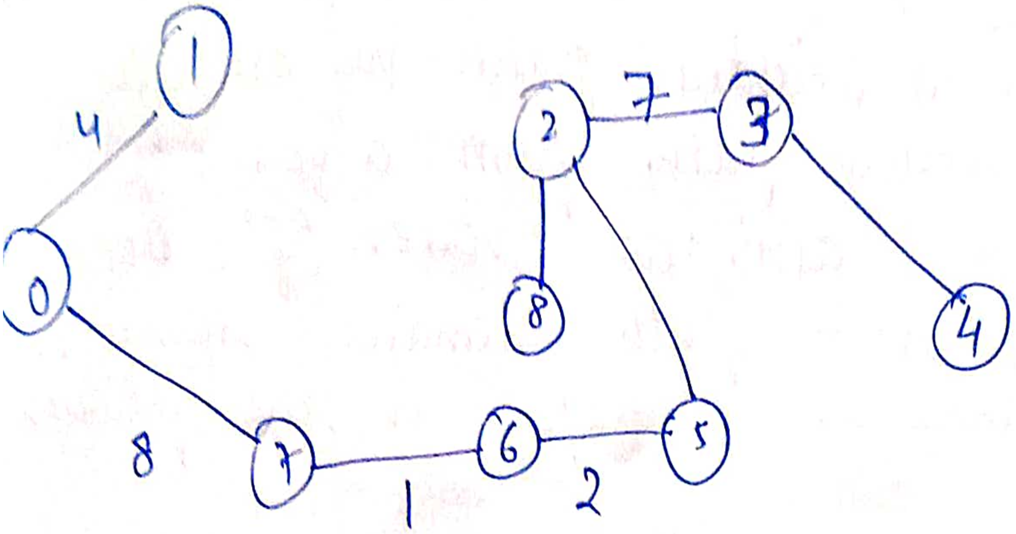
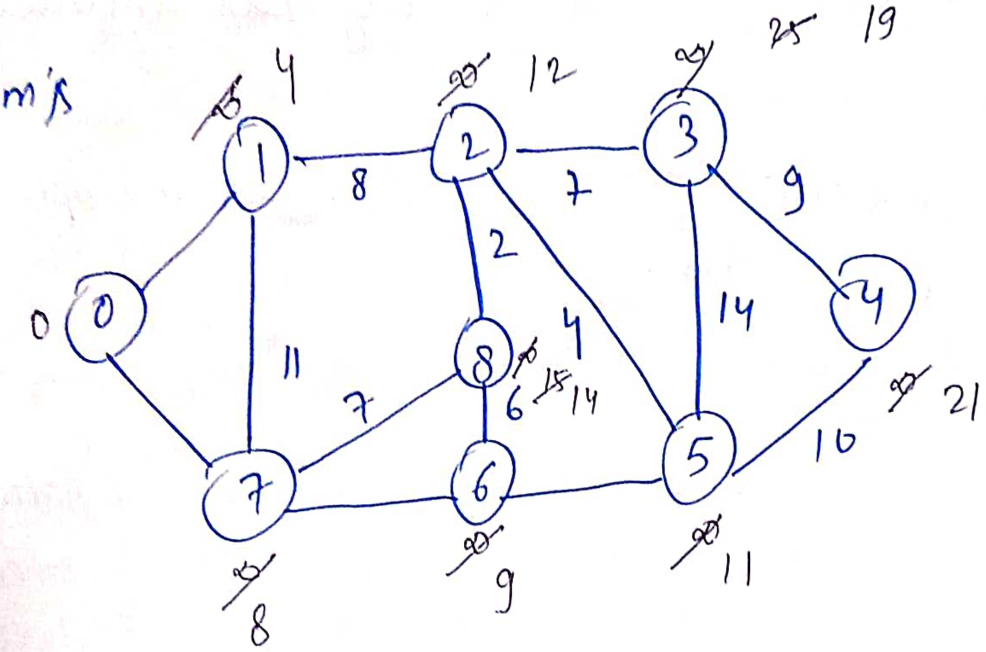
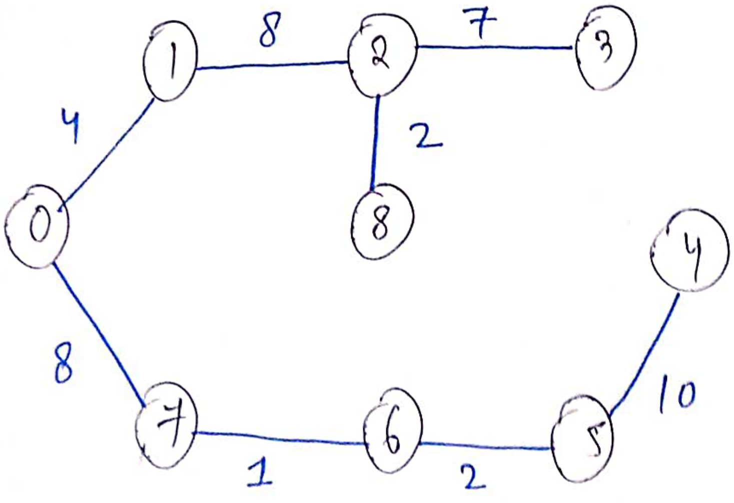


Prim's





MST

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Question 4

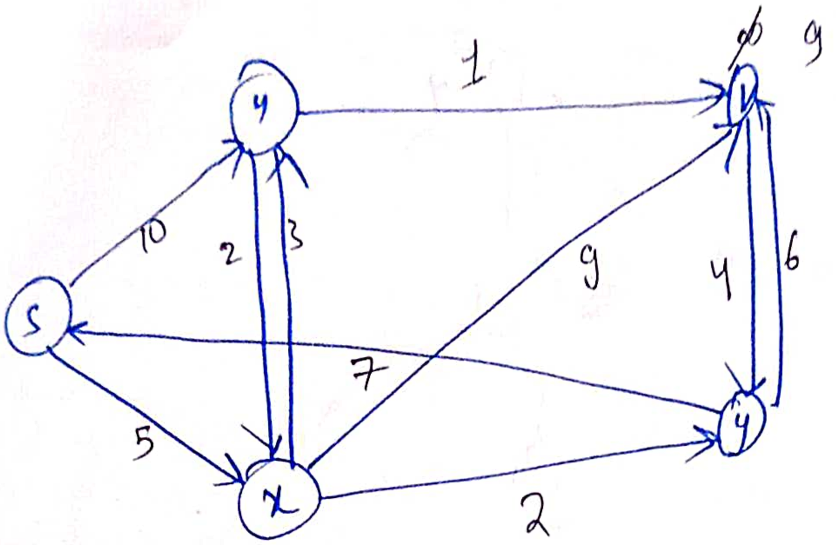
Given a weighted graph. You are also given the shortest path from a vertex 's' to a given destination vertex 't'. Does the shortest path remains same in the modified graph in the following case.

- if weight of every edge is increased by 10 units
- if waight of every edge is multiplied by 10 units.

Solⁿ → The shortest path may ~~may~~ change. The reason is that there may be different no. of edges in different paths from 's' to t. for eg:- let shortest path of weight is 15 and has 5 edges let there be another path with 2 edges and total weight is 25. the weight of the shortest is increased by 5* 10 becomes 15+50. weight of other weight of other path is increased by 2* 10 it becomes 25+20, so the shortest path changes to the other path whose weight is 45.

(ii) If we multiply all edges weight by 10, the shortest path doesn't change. The reason is simple. Weight of all paths from s to t. get multiplied by some amount -t. The number of edges on a path doesn't matter.

us 5 Dijkstra Agorithm. 6.3.

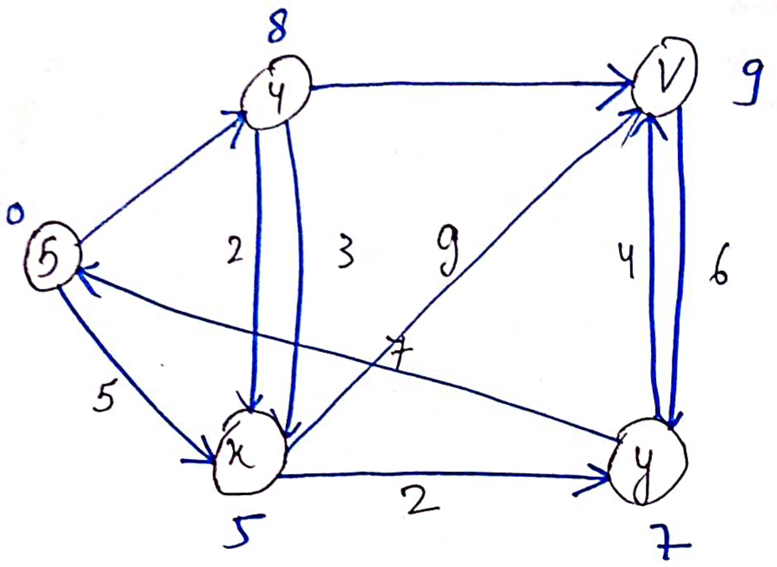


node	Shortest distance from sourcenode
u	8
x	5
V	7
y	9

Bellman ford Algorithm.

1st →	0 S	~~∞~~ 10 u	∞ V	~~∞~~ 5 x	y ∞
2nd →	0 S	10 u	~~∞~~ 11 V	5 x	∞ y
3rd →	0 S	~~10~~ 8 u	~~11~~ 8 V	5 x	~~∞~~ 7 y
4th →	0 S	8 u	9 V	5 x	7 y

final graph:-


8
u
v
9
0
s
2
3
9
4
6
7
5
x
y
2
5
7